Tacoma Smelter Plume Management Plan

Objectives, Priorities, Goals, and Implementation Steps

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ACRONYMS and ABBREVIATIONS

AWSCS	Area-wide Soil Contamination Strategy
BMP	Best Management Practices
CPSC	Consumer Product Safety Commission
CUA	Child-Use Area
CTED	Community Trade and Economic Development
DOH	Washington Department of Health
DEL	Department of Early Learning
DSHS	Washington Department of Social and Health Services
Ecology	Washington Department of Ecology
IAC	Washington State Interagency Committee
L&I	Washington State Department of Labor and Industries
LTCA	Local Toxics Control Account
MTCA	Model Toxics Control Act
OSHA	U.S. Occupational Safety & Health Administration
OSPI	Office of Superintendent of Public Instruction
Parks	Washington State Parks and Recreation Commission
PHSKC	Public Health – Seattle & King County
PLP	Potentially Liable Persons
RAG	Remedial Action Grant
SEPA	State Environmental Policy Act
SHA	site hazard assessment
SSP	Soil Safety Program
STCA	State Toxics Control Account
TPCHD	Tacoma-Pierce County Health Department
TSP	Tacoma Smelter Plume
WISHA	Washington Industrial Safety and Health Act

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of the Tacoma Smelter Plume Project Plan is to provide clear objectives, priorities, and goals to guide the work conducted by the Tacoma Smelter Plume (TSP) team, including the Washington Department of Ecology (Ecology), the Tacoma-Pierce County Health Department (TPCHD), Public Health – Seattle & King County (PHSKC), and other county health departments that may conduct activities associated with the Tacoma Smelter Plume project.

This guidance document integrates work on the Tacoma Smelter Plume project with recommendations from the Area-wide Task Force, Ecology's strategy for area-wide sites, and the 2005 Soil Contamination—Children's Exposure legislation. Much of the information in this project plan is from the final draft of the "Implementation of the Area-Wide Soil Contamination Strategy" (Implementation Strategy) for Washington State (June 30, 2005). The Implementation Strategy will be finalized in the near future and major changes are not expected. This is a long-term project plan, and will be modified annually in conjunction with the evaluations set forth in this project plan.

1.2 TACOMA SMELTER PLUME BACKGROUND

A smelter operated north Tacoma community of Ruston from 1890 to 1985. Heavy metals in the air emissions from the smelter were carried by winds, and deposited on the surface soil in a large portion of the Puget Sound basin. The Department of Ecology (Ecology) and the local health departments in King, Pierce, Kitsap, and Thurston counties have been studying the extent of soil contamination since 1999. The project is known as the Tacoma Smelter Plume project.

Ecology provided site hazard assessment (SHA) grants to the local health departments to:

- Determine the "footprint" of arsenic and lead – the extent of contamination;
- Evaluate the concentration of arsenic and lead in soils where children play; and
- Provide education and outreach to affected communities regarding soil contamination and measures people can take to reduce their risk from exposure.

As of 2005, the extent of contamination covers more than 1000 square miles (see Figure 1). Nearly 300 child-use facilities have been evaluated in King and Pierce Counties, with approximately 1 in 4 having levels of arsenic and/or lead above the state cleanup levels.
The TSP team has provided numerous education and outreach activities to schools, childcares and pre-schools, and the larger public. The education and outreach activities are summarized in "Tacoma Smelter Plume, Summary of Education and Outreach, spring 1999 to spring 2005."

1.3 AREA-WIDE TASK FORCE

Soils in large parts of Washington State contain elevated levels of arsenic and lead caused by past releases from metal smelters and historical application of agricultural pesticides. This low- to moderate- level soil contamination (see Table 1), spread over large geographic areas, is referred to as area-wide soil contamination. The Tacoma Smelter Plume is an example of an area-wide contaminated site.

As Washington's population grows, many areas with elevated levels of arsenic and/or lead continue to be developed into residential neighborhoods, schools, childcares and parks. These development activities raise a variety of health, environmental, and marketplace concerns, and create pressures for cleanup. In early 2000, the Washington State Departments of Agriculture, Ecology, Health, and Community, Trade & Economic Development decided that effective, long-term solutions to area-wide soil contamination problems would require looking beyond traditional cleanup processes and agency boundaries. In 2001, the Washington Legislature appropriated $1.2 million to form and support a stakeholder Task Force to consider these issues.

The Agencies chartered a 17-member Task Force to offer advice about a state-wide strategy to respond to area-wide arsenic and lead soil contamination in Washington State. The Task Force submitted their recommendations to the Agencies in June 2003. The Task Force recommendations to the state agencies are summarized in an Executive Summary (June 30, 2003) in Appendix A. The recommendations are summarized as:

Education is the foundation of recommendations

- Work with and through local governments, particularly health departments, to increase knowledge of area-wide soil contamination through a broad-based education and awareness-building campaign.
- Take a step-wise approach to education and awareness-building.
- Focus on risks associated with exposure of children and of adults who have frequent contact with soil.
- Monitor and evaluate the success of education and awareness-building efforts.

Child-Use Areas (CUA)

- Support, encourage, and assist CUA property owners with implementation of protective measures.
- Encourage implementation of Consumer Product Safety Commission (CPSC) guidelines for maintaining children's safety.

- Require soil testing at new public CUA construction sites and implementation of additional protection measures if contamination is found.

- Establish, with the Washington Department of Social and Health Services (DSHS), a voluntary certification program for family home childcares and childcare centers to indicate that they have taken steps to minimize children's potential for exposure.

Residential Properties

- Offer technical and financial assistance to support and encourage residents to implement individual protection measures, maintain good soil cover, and conduct qualitative evaluations to understand where exposure could occur.

- Provide information on where and how to dispose of contaminated soil and help residents locate sources of soil that meets the Model Toxics Control Act (MTCA) cleanup levels.

Commercial Properties

No further response actions are necessary where surfaces are covered by buildings, parking lots, or other effective soil cover.

Open Land

- Amend State Environmental Policy Act (SEPA) checklist to include a question about whether there is the potential for area-wide soil contamination on a property.

- Encourage developers to conduct qualitative evaluations of properties and, where warranted, carry out soil testing prior to construction. Also encourage developers to incorporate appropriate additional protection measures into site development and construction plans.

- Ensure U.S. Occupational Safety & Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) requirements governing worker protection and safety, and implementation of requirements to control windblown dust and soil erosion due to storm water runoff during construction.

Real Estate Disclosure

Encourage the Washington Association of Realtors to:

- Pursue legislation requiring a real property transfer disclosure statement for open land (in addition to the existing requirements for residential properties) and encourage the voluntary use of the existing seller's property condition report for open land until such legislation is adopted.

- Encourage real estate agents to use disclosure documentation (similar to the lead-based paint disclosure form) for the potential presence of contaminated soils where area-wide soil contamination is likely.

- Create an education course for real estate agents about area-wide soil contamination.

- Draft an article highlighting the Task Force findings and recommendations, including key elements of individual protection measures, for the *Washington Realtor*.

MTCA

- Use regulations instead of policies to implement Task Force recommendations related to MTCA.

- Avoid listing individual properties affected by area-wide soil contamination and instead identify and describe area-wide soil contamination zones.

- Establish in regulation a new enforcement forbearance policy available where property owners choose to implement Task Force recommendations at residential and commercial properties within area-wide soil contamination zones.

- Where properties are sampled and concentrations of arsenic and lead are below cleanup levels, provide a streamlined process to reflect that properties are clean.

Other Recommendations

- Gather additional, scientifically valid information on the health of Washington residents, particularly children, who may be exposed to arsenic and lead.

- Conduct further research to characterize the location and extent of elevated levels of lead in soil from past use of leaded gasoline in Washington.

- Study the effects of area-wide soil contamination on ecological receptors, including plants and animals.

- Provide financial assistance for local government efforts to address area-wide soil contamination particularly the activities of local health departments.

- Seek funding from a broad range of Federal, State, and private sources.

1.4 AREA-WIDE SOIL CONTAMINATION STRATEGY (AWSCS)

The Agencies developed an initial strategy for implementing the Task Force's recommendations, which is documented in this October 2003 report (Appendix B). The strategy is organized around five broad objectives which are the basis for the objectives in this Tacoma Smelter Plume project plan (Section 2.2).

AWSCS Objectives	TSP Project Plan Objectives
1. Improve public awareness and understanding of area-wide soil contamination concerns and solutions	1. Improve Public Awareness
2. Collect and evaluate information to support decisions about reducing the potential for exposure to arsenic and lead in soils	2. Characterize Soil And Implement Protective Measures
3. Reduce the potential for exposure to arsenic and lead in soils at developed properties	3. Characterize Soil And Implement Protective Measures
4. Reduce the potential for exposure to arsenic and lead in soils at properties under development	4. Improve Institutional Capabilities
5. Improve institutional capabilities for responding to area-wide soil contamination	4. Improve Institutional Capabilities

Ecology developed a more detailed implementation strategy (Appendix C). The Implementation Strategy contains programmatic guidance and policies that Ecology will use to address arsenic and lead soil contamination throughout Washington caused by historic smelter releases and past use of lead-arsenate pesticides. Detailed technical guidance for specific issues such as soil sampling, cleanup actions, and Best Management Practices (BMPs) are being developed and will be added to the strategy as technical appendices.

The Implementation Strategy is based on the following key decisions:

- The MTCA regulatory process may be used at properties found to have high levels of arsenic and lead. An alternative approach will be used at properties found to have moderate levels of arsenic and lead soil contamination (see Table 1), no related groundwater contamination, and no other contaminants.

- In part, the alternative approach is a phased approach with initial emphasis on education, voluntary implementation of individual protection measures, and interim actions to prevent exposure; followed by voluntary cleanup actions as properties are developed or redeveloped over time. Elements of the alternative approach are summarized in Table 2.

- Ecology will work internally and with other state and local agencies to institutionalize (incorporate into day to day business) changes so that measures to address moderate levels of contamination are identified and implemented routinely.

- People should be provided information on soil contamination so they can take steps to reduce their exposure. However, Ecology will not implement broad based public awareness campaigns. Ecology may provide funding to other state or local entities to do so.

- Available resources will be prioritized to address properties with high levels of contamination through the regulatory process, while still making progress at properties with moderate levels of contamination. The approach is risk based and will seek to address the greatest risks first.

1.5 SOIL SAFETY PROGRAM

In April 2005, the Legislature passed a new law designed to enhance efforts to protect children from area-wide soil contamination in the Tacoma Smelter Plume (TSP). The new law requires:

(1) Identification of all known child-use areas (e.g., schools, childcares) within the TSP;

(2) Qualitative evaluation to determine potential exposure to children;

(3) Soil sampling if potential for exposure exists; and

(4) Assistance for schools and childcares to implement best management practices (BMPs) that reduce exposure to arsenic- and lead-contaminated soil.

Ecology, PHSKC, TPCHD, and other interested stakeholders have designed a Soil Safety Program to implement the law (Appendix D).

The scope of effort under the law is considerable. While this project plan identifies all proposed tasks related to the Tacoma Smelter Plume, most of the resources are focused on implementing the Soil Safety Program.

2.0 TACOMA SMELTER PLUME PROJECT PLANNING GUIDANCE

2.1 VISION FOR SUSTAINABILITY

Healthy actions to reduce risks from contaminated soil will be incorporated into daily life, through partnerships among government, educational and childcare groups, residential communities, interest groups and business.

- As soil in the plume area may be contaminated for centuries, it will be the policy and fiscal responsibility of government to provide affected populations with ready access to clear information about soil contamination and protective measures to reduce risk from exposure.

- Local and state government agencies will have procedures to address soil contamination and to educate their clients on risk reduction and remediation.

- Schools, childcares, preschools, parks and camps will apply best management practices, and cleanup of contaminated soil if appropriate, and integrate these practices into their maintenance programs and their classroom curriculum.

2.2 OBJECTIVES

Ecology, PHSKC, and TPCHD identified the following objectives which provide overarching guidance for Tacoma Smelter Plume soil contamination activities. These objectives are consistent with the recommendations of the Area-wide Task Force and the objectives of the Area-wide Soil Contamination Strategy (Appendix B).

OBJECTIVES

1. **Improve Public Awareness** and understanding of soil contamination and protective measures to reduce risk from exposure.
2. **Characterize Soil And Implement Protective Measures** - collect and evaluate information to support decisions on implementing measures to reduce risk from exposure to arsenic and lead in soil.
3. **Improve Institutional Capabilities** for responding to arsenic and lead in soil.

2.3 PRIORITIES

To achieve the objectives described above, staff resources and grant funding will be prioritized towards the following:

1. Audiences that have daily, direct influence over young children and their environment.

   Ecology and the health departments are concerned about long-term exposure to the contaminated soil, especially for young children. Children are especially vulnerable because they eat, drink and breathe more in relation to their body size than adults. They tend to put their hands in their mouths and play on the floor where dirt and dust from outside activities gets tracked inside.

   For the Tacoma Smelter Plume project, we have defined the target audience in priority order as:

   (1) Young children under 6 years of age and those that directly influence a young child's environment (e.g., parents, teachers, childcare providers).

   (2) Children 6-12 and their caretakers.

   (3) Children 12-18 and their caretakers.

2. Properties where groups of young children are present on a regular basis, including:

   - Preschools, schools, childcares, parks, camps, and residences. Within these properties, specific areas where children are most likely to have direct contact with contaminated soil (such as playgrounds) should be addressed first.
   - Properties with high levels of arsenic and/or lead in soil are a higher priority than properties with moderate levels of arsenic and/or lead in the soil. *High and moderate levels are defined in Table 1*.
   - Schools and childcares are higher priority than parks or camps. *In general, the potential exposure is higher at schools and childcares because of the greater frequency of exposure and daily density of children.*
   - Publicly owned facilities are a higher priority than privately owned facilities. *Publicly owned facilities tend to be more easily accessible by the public and serve a greater number of children. According to the legislation, funding will be provided to health departments to test soil at public and private schools and childcares, not camps or parks, during the '05-'07 biennium.*
   - Because of the large number of residential properties potentially affected by plume emissions, TSP activities will be focused only on broad based public awareness and, as funds are available, a residential soil sampling service. In addition, sampling and remediation will be incorporated into land use planning and development processes as part of Objective 3.

3. Geographic areas with greater potential for high levels of arsenic or lead in soil. *High and moderate levels are defined in Table 1.*

   For the Tacoma Smelter Plume, there are two geographic areas of interest. The first is the full extent of the plume contamination—the Footprint. The Footprint encompasses over 1000 square miles of King, Pierce, Kitsap, Thurston, and potentially Snohomish counties (Figure 1). The pattern of contamination shows higher levels closer to the smelter, decreasing with distance from the smelter.

   The second geographic area of interest is a zone of potentially higher concentrations closer to the smelter used to focus child-use area (CUA) studies—the Soil Safety Program (SSP) Service Area* (Figure 2).

   The priority area for Tacoma Smelter Plume activities covers the following:

   - Mainly, areas within the SSP Service Area as defined for the Soil Safety Program.
   - Some areas outside of the SSP Service Area necessary to address environmental and social justice issues. (For example, children with learning disabilities and pica behavior often attend specific schools which may be outside of the service area).
   - The King County SSP Service Area, which generally includes Vashon-Maury Island, Normandy Park, Burien, DesMoines, SeaTac, Federal Way, and parts of West Seattle, Kent, Tukwila and unincorporated King County.
   - The Pierce County SSP Service Area, which generally includes Tacoma, Fircrest, University Place, Lakewood, Steilacoom, Dupont and Gig Harbor.
   - The Thurston County SSP Service Area, which generally includes the highland area west of the Nisqually delta.

***Note:** CUA Study Zone is a term used for the CUA studies through 2005. In 2005, legislation was passed specific to sampling CUAs. We call the program Soil Safety Program. Now the CUA Study Zone is called the Soil Safety Program (SSP) Service Area. The SSP Service Area and CUA Study Zone were defined similarly. Both looked at the "Footprint" data and estimated the distance beyond which we don't expect to find as high as 100 ppm arsenic. The SSP Service Area was then modified based on health department input.*

2.3.1 CONSIDERATIONS

Additional considerations for Tacoma Smelter Plume activities include the following issues:

1. Measures to protect human health will take priority over protection of ecological receptors. *Property owners seeking No-Further-Action from Ecology must address both human and ecological risks.*
2. Environmental justice will be considered when making funding decisions and prioritizing services.
3. Special outreach approaches may be necessary to reach seasonal audiences within the SSP Service Area. *During the summer, there are visitors to Vashon-Maury Island, staying in summer homes and utilizing parks and camps, who are unaware of the contamination.*
4. Outreach to health care providers may need to include those providers outside of the SSP Service Area as some families within the Service Area visit physicians outside of the Service Area.

2.4 FUNDING & PARTNERSHIPS

Ecology, PHSKC, and TPCHD are working in partnership to address the public health concerns associated with the Tacoma Smelter Plume. Partnerships with other health departments (e.g., in Thurston County, Kitsap County, Snohomish County), other agencies, and stakeholders will develop over time as project activities progress.

The following sections detail the implementation steps to meet the project objectives (Section 2.2). Those implementation steps to be carried out by the local health departments are currently funded by site hazard assessment (SHA) grants from the Local Toxics Control Account (LTCA). Grant Scopes of Work detailing the health department work will be attached as appendices to this project plan. The Scopes of Work will be revisited quarterly, and may be modified as part of adaptive management.

Those implementation steps to be carried out by Ecology are generally funded by the State Toxics Control Account (STCA). A workplan detailing Ecology's work will be attached as an appendix to this project plan. Ecology's workplan will also be revisited quarterly, and may be modified as part of adaptive management.

Specific to the Soil Safety Program:

- PHSKC and TPCHD will conduct the soil sampling and outreach activities which are funded under the SHA grants.

- Ecology will oversee the implementation of BMPs. Funding will come from the Safe Soil Account, Clean Sites Initiative, and Remedial Action Grants.

- Ecology will ensure all tasks are completed by the legislative deadlines. Any activities not completed by the health departments will be completed by Ecology.

3.0 Objective 1: IMPROVE PUBLIC AWARENESS

3.1 GOALS

1. Improve awareness of soil contamination and actions that reduce exposure among the general public.
2. Children, and the adults that directly affect their environment, will have an increase in awareness about soil contamination and actions that reduce exposure and the adults will take actions that reduce exposure.
3. PHSKC, TPCHD and Ecology, will establish sustainable partnerships that result in increased capacity for improving public awareness and taking actions that reduce exposure.

3.2 IMPLEMENTATION STEPS

The Tacoma Pierce County Health Department (TPCHD) and Public Health Seattle King County (PHSKC) and Ecology annual Outreach and Education work plan(s) referenced below will be consistent with the priorities and general planning guidelines outlined in section 2 of the TSP Management Plan (pages 11-13).

General

1. TPCHD and PHSKC will develop and implement *(annually)* a broad based public awareness campaign plan through the use of the following mechanisms most appropriate for their local communities *(Deadline: ongoing):*
   a) Presentations and distribution of materials at community meetings, fairs and/or conferences;
   b) Articles in newspapers or other publications; Web site;
   c) Paid television, radio ads, posters and/or bus placards; and
   d) Direct mass mailings.

2. Ecology will develop and maintain Web sites *(Deadline: ongoing).*

3. Ecology will develop and produce for distribution: soil sampling and other guidance documents *(deadline: January 2007)* including:
   a) General guidance brochure;
   b) Large child-use play areas (parks, camps, schools, childcare centers); and
   c) Small child-use play areas (residential yards, home childcares).

4. PHSKC and TPCHD will sustain or strengthen existing partnerships and create new partnerships with established groups that are available for multi-year, long-term partnerships. A listing of those partnerships will be provided with the agency specific outreach and education plan. *(Deadline: Ongoing).*

5. PHSKC and TPCHD will develop partnerships that enhance their ability to improve public awareness and actions that reduce exposure in non-English speaking and financially disadvantaged communities. *(Deadline: Ongoing)*

Schools

6. Ecology (in coordination with the local health departments) will make initial contact with the Office of Superintendent of Public Instruction (OSPI) and school districts to explore options to support health departments' outreach and education work (e.g., curriculums, Web site coordination, teacher training). *(Deadline: June 30, 2007).*

7. PHSKC and TPCHD (and other local health departments as appropriate) will work with all school districts (in coordination with Ecology) and schools (subject to priorities in Section 2) within the SSP Service Area to implement a) general awareness, b) curriculums, and c) training programs encouraging children, school staff, and parents to reduce exposure to contaminated soils. *(Deadline: Ongoing)*

Childcares

Note: Childcares include Head Start programs, Early Childhood Education and Assistance Programs (ECEAP), preschools and licensed childcares.

8. Ecology (in coordination with the local health departments) will work with Department of Early Learning (DEL) and/or childcare organizations to raise awareness by:

   a) Supporting health departments' outreach and education work (for example, Web site coordination). *(Initial contact by June 2007 and then ongoing)*

   b) Integrating soil contamination and health risk messages into childcare licensors and health advisors training. *(Initial contact by June 2007 and then ongoing)*

   c) Providing public participation grants to non-profit childcare organizations to support local health department activities and distribute outreach and education materials to childcare providers within the SSP Service Area. *(Initial: September 2006). Review annually*

9. PHSKC and TPCHD (and other local health departments as appropriate) will work with childcares (subject to priorities in Section 2) within the SSP Service Area to provide:

   a) General awareness.

   b) Curriculum and materials.

   c) STARS accredited training to childcare providers, administrators, and other audiences as appropriate.

   d) Training that encourages children, childcare staff, and families to take actions that reduce exposure to contaminated soils.

   (Deadline: Ongoing)

Parks, Camps, Multi-family housing and Residential properties

10. Ecology, PHSKC and TPCHD will address soil contamination in existing parks, camps and multi-family housing with child use areas within the SSP Service Area that are not being addressed through the Soil Safety Program by:

    a) Developing a plan to conduct an inventory. *(Deadline: June 2009) See also Section 4, Implementation Step #5)*

    b) Developing and beginning to implement a plan to inform the parks, camps and multi-family housing residents/managers and owners about soil contamination and actions they can take to reduce exposure for employees, residents, visitors, children, and families. *(Start by December 2009)*

11. TPCHD will conduct outreach and education in conjunction with the pilot program for residential soil sampling and Home Environmental Assessment (HEAL) visits for interested residents within the SSP Service Area. *(Deadline: June 30, 2007).* At completion of the pilot, TPCHD will share lessons learned and the TSP project will evaluate whether this program should continue or be expanded to other jurisdictions.

3.3 EVALUATION and REPORTING

TPCHD, PHSKC and Ecology will develop and implement methods to evaluate the effectiveness of various outreach and education activities and report results and share lessons learned. (Deadline: at least annually; specific campaigns may have specific due dates).

Because of the difference in population size and distribution within the Tacoma Smelter Plume, some performance measures are different for each of the health departments. Specific reporting requirements related to Outreach and Education will be negotiated as part of the grant process and will be reviewed at least every six months. Evaluation results will be used to produce end of biennium reports and to revise and improve outreach and education efforts. Evaluation plans and report timing will be implemented so that information will inform the next grant cycle.

TPCHD, PHSKC and Ecology will develop, implement and coordinate on databases and information systems needed to track negotiated quantitative (and other) measures.

Qualitative Evaluation

Qualitative evaluation methods could include focus groups, surveys or program evaluations for specific programs (for example, curriculums or trainings). Reports from these evaluation methods should include findings, lessons learned and recommendations related to outreach and education activities.

Quantitative Evaluation

TPCHD, PHSKC, and Ecology will report quantitative performance measures to be identified in the agency specific Outreach and Education work plans, but should include the following priority target audiences:

(1) Number of children under 6 years of age.

Number of parents or teachers that directly influence children under 6 years.

(2) Number of children 6-12.

Number of caretakers for children ages 6-12.

(3) Number of children 12-18.

Number of caretakers for children ages 12-18.

Quantitative evaluations will measure impact on the target audiences in priority locations and geographic areas, when possible:

(1) Childcares and schools.

(2) Parks and camps.

(3) Residences.

- King County Service Area generally = Vashon-Maury Island, Normandy Park, Burien, Des Moines, SeaTac, Federal Way, and parts of West Seattle, Kent, Tukwila and unincorporated King County.
- Pierce County Service Area generally = Tacoma, Fircrest, University Place, Lakewood, Steilacoom, Gig Harbor and Dupont.
- Thurston County Service generally = highland area west of the Nisqually delta.

Process Measures

Process measures should be reported to help plan for publication and distribution of materials, including:

- Number and type of events (meetings, fairs).
- Number and type of educational materials distributed
- Type of training or presentation.

(The SSP tracking system includes outreach materials distributed at schools and childcares specific to sampling at those facilities.)

Baseline Assessments

TPCHD and PHSKC will conduct select baseline assessments to establish benchmarks to evaluate awareness or behavior change. Baseline surveys implemented will be included in work plans in the evaluation section.

Evaluate if it is possible to integrate a baseline assessment to establish benchmarks to evaluate awareness or behavior change as part of the SSP tracking system and follow-up on schools and childcares with levels above criteria.

4.0 Objective 2: CHARACTERIZE SOIL AND IMPLEMENT PROTECTIVE MEASURES

4.1 GOALS

Properties with schools and childcares

1. Soil in all child play areas at existing **schools and childcares** located within the Soil Safety Program (SSP) Service Area will be characterized for arsenic and lead using qualitative evaluation and, as appropriate, soil testing. Protective measures, or soil safety actions, will be implemented at schools and childcares with high or moderate levels of arsenic and/or lead. This goal fulfills the Soil Safety Program legislation, Chapter 70.140 RCW, and is to be completed by December 2009.
2. Soil in child play areas at **schools and childcares** outside of the Service Area will be characterized for arsenic and lead through qualitative evaluation and, as appropriate, soil testing at the property owner's discretion and cost. At play areas with high levels of arsenic and/or lead, protective measures will be implemented. At play areas with moderate levels of arsenic and/or lead, protective measures will be implemented when opportunities arise (for example, during renovation or maintenance) at the property owner's discretion and cost. After December 2009, the agencies will re-evaluate this goal using information gathered during the Soil Safety Program.

Other properties

3. Over time (10 years), soil in all child play areas at **parks, camps, and multi-family housing** within the Service Area will be characterized for arsenic and lead using qualitative evaluation and, as appropriate, soil testing. Protective measures will be implemented at play areas with high levels of arsenic or lead. At play areas with moderate levels of arsenic or lead, protective measures will be implemented when opportunities arise (such as during renovation or maintenance) at the property owner's discretion and cost.
4. Soil in child play areas at **parks, camps, and multi-family housing** outside of the Service Area will be characterized for arsenic and lead using qualitative evaluation and, as appropriate, soil testing at the property owner's discretion and cost. Protective measures will be implemented at play areas with high levels of arsenic or lead. At play areas with moderate levels of arsenic or lead, protective measures will be implemented when opportunities arise (such as during renovation or maintenance) at the property owner's discretion and cost.

5. All **residential** property owners within the Footprint interested in characterizing soil for arsenic and lead contamination, and implementing protective measures will have access to information and technical assistance.
6. All property owners within the Footprint interested in characterizing soil for arsenic and lead contamination, and implementing protective measures will have access to information and technical assistance.
7. Soil at all properties within the Footprint being developed or re-developed will be characterized, when appropriate, for arsenic and lead as a part of the development process. Protective measures will be implemented as appropriate. Properties with high levels, as defined in Table 1, will be treated as Model Toxics Control Act sites. *Implementation steps for this goal are primarily related to institutional changes and are listed in that section.*
8. Soil at all new state and federal hazardous waste cleanup sites within the Footprint will be characterized for arsenic and lead as a part of the overall cleanup for that site. Soil contamination will be remediated consistent with the substantive requirements of the Model Toxics Control Act.
   Note: "site" in this situation is defined as any area in which a hazardous substance has come to be located. Implementation steps for this goal are primarily related to institutional changes and are listed in that section.

4.2 IMPLEMENTATION STEPS

1. Ecology, in coordination with the local health departments and a consultant, will develop a Soil Safety Program design *(Deadline: April 30, 2006)* and implement the Soil Safety Program for schools and childcares within the Service Area *(Ongoing through December 31, 2009).* The program design will include the following tasks:
   a) Identify schools (public and private) and childcares.
   b) Request access and conduct qualitative evaluations/assessments.
   c) Conduct soil sampling and evaluate the results.
   d) Provide test results and steps to implement Soil Safety Actions.
   e) Provide technical assistance, including funding, to implement Soil Safety Actions.
   f) Provide outreach and education as needed.
   g) Inspect and track if Soil Safety Actions are implemented.

   See Appendix D for the detailed implementation steps for the Soil Safety Program. Note: Previously sampled schools and childcares will be contacted as a part of the Soil Safety Program

2. Ecology, in coordination with the local health departments will develop *(by January 2007)* soil sampling guidance and protective measures guidance brochures for:

   a) Large child-use play areas (parks, camps, schools, childcare centers); and

   b) Small child-use play areas (residential yards, home childcares).

   The agencies will provide these guidance brochures upon request and track the number of copies and location of recipients. *(On-going)*

3. Ecology, TPCHD, or PHSKC will follow-up with previously sampled child-use properties (parks and camps) with moderate to high levels of arsenic and lead to provide information about protective measures. *(Deadline: June 30 2008-as time allows)*

4. Ecology, TPCHD, or PHSKC will develop a plan to inventory existing parks, camps, multifamily housing with child use areas, and other places with child use areas within Service Area that are not being addressed through the Soil Safety Program. *(Deadline: June 2009). See also Objective 1 step 10 for Outreach and Education.*

5. Ecology, in coordination with the local health departments will develop soil sampling and protective measures guidance brochures for properties under development *(Deadline: June 30, 2007). See also Objective 3-section 5.*

6. Upon request, and dependent on available funding, Ecology will provide technical assistance (such as for soil characterization, protective measure implementation, and remediation) and funding (subject to priorities in Section 2) to property owners within the Footprint. Ecology will track the number and location of recipients of this technical assistance. *(Deadline: On-going).*

7. TPCHD will conduct a pilot residential outreach and education program in conjunction with soil sampling and Home Environmental Assessment (HEAL) visits for interested residents within the SSP Service Area. Soil Sampling results and lessons learned will be reported to Ecology. *See Objective 1 Implementation Step 11.*

4.3 EVALUATION

TPCHD, PHSKC and Ecology will develop and implement methods to evaluate the effectiveness of the SSP and other soil characterization activities and protective measures. The agencies will report results and share lessons learned.

Evaluation results will be used to produce end of quarter and annual reports, and special Soil Safety Program reports required by the legislature. Results will also be used to revise and improve soil characterization efforts and protective measures.

TPCHD, PHSKC and Ecology will develop, implement and coordinate on databases and information systems needed to track quantitative measures to be developed as part of the evaluation plan for this objective.

Quantitative Evaluation - Soil Safety Program (SSP)

TPCHD, PHSKC, and Ecology will address quantitative performance measures as identified in the Soil Safety Program. Information will be collected and reported for 1) public schools, 2) private schools, and 3) childcares as follows:

- Number of facilities identified within the service area.
- Number of qualitative evaluations or assessments conducted.
- Number of facilities requiring sampling.
- Number of facilities that did not need sampling and why.
- Number of sampled and number with arsenic or lead levels above MTCA.
- Number of facilities that are above the criteria for arsenic or lead and require Soil Safety Actions.
- Number of facilities initiating Soil Safety Actions.
- Number of facilities that did not implement Soil Safety Actions when they were recommended
- Any instances when it was necessary to notify a regulatory agency because Soil Safety Actions were not implemented and parents were not notified.

Quantitative Evaluation - Other

Ecology, in collaboration with local public health, will identify possible mechanisms to track and evaluate:

- Child play areas not in the SSP.
- Other properties (see Implementation Step #7).

Information tracked may include:

- Number and type sampled and results.
- Number of technical assistance consultations provided for sampling or remediation.
- Number of sites that underwent remediation such as soil removal or covering.

Process measures

- Number of soil sampling brochures distributed.
- Number of protective measure brochures distributed.
- Number of technical assistance contacts.

Qualitative evaluation

- Report on lessons learned and challenges to implementing activities.
- Follow-up processes implemented with childcare facilities and schools to assess Soil Safety Actions taken and still being implemented.

5.0 Objective 3: IMPROVE INSTITUTIONAL CAPABILITIES

5.1 GOALS

1. Increase institutional capability to improve public awareness.

   Measures to promote awareness, collect data, and reduce or prevent exposure to arsenic- and/or lead-contaminated soil at all properties will be integrated into the day to day operations of public and private stakeholders. To meet priorities (Section 2), our primary focus is on integrating these measures into the day to day operations of agencies involved in management and oversight of properties with child play areas.

2. Increase institutional capability to characterize soil and implement protective measures.

   All properties under development (or major re-development) will have concentrations of arsenic and/or lead in soil below MTCA cleanup levels of 20 ppm and 250 ppm, respectively. To meet priorities (Section 2), our primary focus is on soil in child play areas.

5.2 IMPLEMENTATION STEPS

The implementation steps are grouped by targeted institution or group. Priority for implementation is designated by HIGH, MEDIUM AND LOW. Priority for action will be taken into consideration when agencies develop and implement work plans. Many of the activities are focused on changing local policies.

Ecology and Public Health

1. Ecology will improve and streamline the agency's technical assistance, program activities and State Environmental Policy Act (SEPA) review processes related to arsenic and lead soil contamination. Examples of these processes include: Facility Site Atlas-mapping; SEPA comment language; the SEPA checklist; Voluntary Cleanup Program (VCP) language; and identification of soil disposal options. The agency will educate site and section managers in the Toxics Cleanup Program (TCP) so that cleanups for other contaminants also address arsenic and lead, as appropriate. Other program and section managers in Ecology will also be educated, such as from water quality and solid waste programs. *(Deadline: December 2007)* HIGH

2. Local public health will work with other agency staff to incorporate TSP soil contamination messages into their day-to-day work. Collaborations may include public health nurses, solid waste staff and school safety staff. *(Deadline: December 2007)* MEDIUM

Educational Institutions

3. Ecology will work with the appropriate agencies, in collaboration with local health departments, to support the integration of soil contamination issues into best management practices (BMPs) or guidance that impacts educational facility operations. Collaborations include:

    a) Working with the Department of Early Learning (DEL) and Educational Service Districts (ESDs) to condition the licensure of childcares and Head Start facilities. *(Deadline: Start by December 2007 and complete by Dec. 2009)* HIGH

    b) Working with DEL to create childcare facility operator guidance documents that meet Consumer Product Safety Commission (CPSC) guidelines. *(Deadline: Start by December 2007 and complete by Dec. 2009)* HIGH

    c) Working with the Office of the Superintendent of Public Instruction (OSPI) to create state K-12 health and safety guidance that meets CPSC guidelines. *(Deadline: Start by December 2007 and complete by Dec. 2009)* HIGH

4. Ecology will collaborate with local health departments to support the integration of soil contamination messages into training programs and healthy action curriculums for, in order of priority:

    a) Childcare teachers and workers, Head Start (working with DEL health advisors).

    b) Early learning degree programs (working with DEL, colleges, community colleges).

    c) Elementary schools teachers (working with OSPI).

    (Start by June 2008) MEDIUM

5. Ecology will work with childcare organizations/associations to identify strategies to institutionalize soil contamination concerns and to support local health education and outreach to providers and parents. *(Deadline December 2009).* MEDIUM.

Land Use and Construction

6. Ecology, in collaboration with local government stakeholders, will develop a strategy *(by December 2006)* and action plan to integrate soil contamination issues into local government land use planning and development policies and processes, including training for planning staff. *(Deadline: December 2007).* HIGH

7. Ecology will work with the appropriate state or local agencies, to support the integration of soil contamination BMPs and guidance into day-to-day practices for new construction, major maintenance or reconstruction projects, for:

    a) Schools, including construction grants (OSPI, local health officers, Department of Health (DOH)). *Deadline: December 2007* HIGH

    b) Parks, including construction grant programs (Parks and Recreation Commission (Parks), Interagency Committee (IAC), private parks work group). *Deadline: December 2007* HIGH

    c) Other state agencies with a focus on public housing, clean air, storm water and solid waste regulations/permitting. *Deadline June 2008 MEDIUM*

    d) WSDOT construction activities. *Deadline: December 2009* LOW

    e) Construction worker OSHA-WISHA standards and procedures, Department of Labor and Industries (L&I), and worker associations. *Deadline: December 2009 LOW (consider a review of this in the context of Implementation Step 6 above)*

8. Ecology will work with realtor and other land transaction professional organizations (home inspectors, appraisers, financial) to address TSP soil contamination issues through:

    a) Professional training and education programs regarding soil contamination.

    b) Identifying options to notify buyers about soil contamination, healthy actions and cleanup on affected property.

    c) Encouraging the passage of legislation requiring a real property disclosure statement for open land (and use of the voluntary seller's property condition report in the interim).

    d) Realtor use of disclosure documentation (similar to lead based paint disclosure).

    (*Deadline: December 2009):* LOW

Other Government

9) Ecology will share information and coordinate with the Federal and other governments to encourage that soil contamination is addressed on land under their jurisdiction, including:

   a) EPA –Ruston superfund site. *(Deadline: January 2007)* HIGH

   b) Military bases. *(Deadline: December 2009)* LOW

   c) Tribes. *(Deadline: December 2009)* LOW

10) Ecology will work with state agencies to implement grants in support of activities that improve institutional capabilities related to increasing public awareness and reducing or preventing exposure to contaminated soils, such as:

   a) Solid Waste program for public participation grants to childcare groups, 100% grants to public schools and childcares and/or partial site cleanups (for example, ball fields). *Deadline: December 2008* MEDIUM
   b) Explore grants to local planning agencies. *Deadline: June 2007* HIGH

5.3 EVALUATION and REPORTING

TPCHD, PHSKC and Ecology will develop and implement methods to evaluate the effectiveness of improving institutional capabilities activities and report results and share lessons learned. *(Deadline: at least annually; specific activities may have specific due dates.)*

Business Practices Assessment

A checklist of items or procedures to be changed and/or new procedures incorporated into day-to-day business practices will be developed for each of the targeted institutions or groups. An assessment will be conducted to evaluate what components have been incorporated or changed for:

- State or local agencies *(specific names/types)* responsible for educational policy or construction of public facilities with child use areas have incorporated soil contamination into day-to-day procedures and policies.
- Local jurisdiction planning offices *(listing of local jurisdictions-departments)* have integrated arsenic and lead soil contamination review into permit application, SEPA and/or other planning and development business practices.

Quantitative Evaluation

Ecology will work with local jurisdictions to develop a method to track the number of properties that have implemented soil sampling or remediation through local planning and permit activities or the Ecology VCP program.

The realtor or other land use transaction professional organizations (specific names/types) that have implemented training programs and the number of professionals (specific names/types) that have been trained about soil contamination issues will also be tracked.

The dollar amount of grants that have been issued to specific organizations to address soil contamination issues will be tracked.

Qualitative evaluation

Report on lessons learned and challenges to implementing activities. Report on informal feedback or focus groups from stakeholders.

6.0 OTHER ACTIVITIES

6.1 PHYTOREMEDIATION STUDY

Ecology is evaluating a technique that may be helpful in removing arsenic and lead from individual properties within the Tacoma Smelter Plume and other area-wide contamination zones throughout Washington State. In 2005, Ecology, Public Health-Seattle & King County and the Tacoma-Pierce County Health Department began a phytoremediation pilot study using arsenic-concentrating ferns.

Researchers at the University of Florida have determined that the introduced species *Pteris vittata*, commonly called the Chinese Brake Fern accumulates arsenic in its foliage at up to four orders of magnitude higher concentration than the soils in which it grows. Phytoremeditation of arsenic in soil has been successful in locations throughout the United States, and offers a potentially inexpensive and less disruptive remediation option for cleaning surface soils.

6.1.1 GOALS

The pilot study is designed to evaluate the effectiveness of *P. vittatae* (or a closely related species) in this climate for use in remediating arsenic at moderately contaminated (20-100 mg/kg arsenic in soil) to highly contaminated (100-500 mg/kg arsenic in soil) properties on Vashon or Maury Island.

Additional study questions include:

- Will *P. vittatae* also remediate lead? Cadmium?
- Are brake fern species invasive in western Washington?
- What is the plant survivorship ratio in western Washington?
- How much irrigation, if any, is needed for optimal plant growth here?
- Will plants successfully over-winter here?
- Do the plants propagate naturally here?
- Do any local insects or animals feed on the plants? If so, do they pose a hazard to the insect or animal?
- What are optimal growing conditions for *P. vittatae* in western Washington?
- What is the concentration of arsenic in fern fronds here? Cadmium? Lead?
- How can the arsenic-contaminated fronds be safely and legally disposed of?

- How can the arsenic-containing fronds be kept out of composting and recycling processes?

- Does the presence of cadmium interfere with *P. vittata* uptake of arsenic?

6.1.2 IMPLEMENTATION STEPS

Ecology purchased ferns from a company that propagates and sells *P. vittata* and other closely related species for use in arsenic remediation. Plots were prepared and planted initially in mid-spring (late April-early May) 2005 and maintained through the summer. Approximately 100 ferns were then planted in test plots at:

- Two locations in Dockton Park (Maury Island, King County);

- Three locations on Vashon Island School District property (Vashon Island, King County); and

- Two locations at Point Defiance Park (Pierce County).

During the planting, soil and frond samples were collected to determine the baseline levels of arsenic, lead, and cadmium.

In fall of 2005, the study team harvested the fronds before they wilted and fell to the ground potentially releasing the arsenic they had removed back to the soil. They then sampled the soil and fronds for arsenic, lead, and cadmium. Survivorship was assessed in spring 2006. Shaded plots were decommissioned in the summer of 2006 due to poor survivorship (0-22%). The remaining two plots were harvested and soils sampled in fall of 2006. Survivorship will be assessed in early Summer 2007, and remaining plots decommissioned.

6.1.3 EVALUATION

In early summer 2007, Ecology will measure the number of surviving plants and clear the remaining plots, ending the study. It appears the study will answer some of the research questions posed in section 6.1.1. Final results will be posted on the TSP Web site at http://www.ecy.wa.gov/programs/tcp/sites/tacoma_smelter/Phyto/phyto_hp.html.

7.0 PROJECT EVALUATION

A summary report will be prepared every two years and timed to inform the biennial grant cycle. The project evaluation will be based on evaluation reporting for each objective and any reports/outcomes from special studies. Proposed content includes:

1. Project Goals and Objectives – Brief summary.

2. Implementation steps.

3. Accomplishments by Objective – results tied to the implementation steps.

   - Quantitative – Summary of performance targets and indicators.
   - Qualitative – Descriptive results including whether results turned out as anticipated and if not, what was different.

4. Challenges or barriers encountered – How were these addressed?

5. Next Steps – If objectives were met, what follow-up will be done? If objectives were not met, what changes have been or will be made?